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Becoming Neolithic in Words, Thoughts and Deeds

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ABSTRACT

How did people come to ‘think Neolithic’? While there has been considerable progress on reconstructing the environmental, economic, technological and social changes associated with the transition from mobile hunter-gathering to sedentary farming and herding communities, we remain limited in our understanding of how Neolithic culture in its most profound sense arose. I suggest that the formation of new words required for that new lifestyle was as much a driver as a consequence of the Neolithic transition, illustrating this with a sample of Neolithic innovations from the southern Levant that appear likely to have required new words. Such words, I argue, helped to establish new concepts in the mind, shaped thought, influenced perception and ultimately the human deeds in the world that left an archaeological trace.

KEY WORDS

Neolithic, Words, Thoughts, Culture

INTRODUCTION

I wish to draw attention to the wordsmiths of the Neolithic transition: those people within the Epi-Palaeolithic and early Neolithic communities who invented the words required for the new sedentary and farming way of life that was consolidated around 10,000 years ago. Such word invention might have been deliberate or accidental, made by children playing or by figures of authority. We simply do not know. But my proposition is that such words not merely aided communication but enabled new concepts to become established in the mind, which then shaped thought and influenced the manner in which the world was perceived. As such, they were as much a driver as a consequence of cultural change from the Palaeolithic into the Neolithic, and beyond.

Progress in understanding the Neolithic transition has been considerable. New excavations, developments in absolute dating, palaeoenvironmental reconstruction and the application of scientific techniques have profoundly improved our understanding of the emergence, spread and diversity of Neolithic lifestyles (e.g. Pr & Bar-Yosef 2011; Dietrich et al. 2012; Broushaki et al.

2016; Mithen et al. 2018). While global generalizations are problematic, two themes are common. First, the often-gradual process of the transition – we are dealing with evolution rather than revolution (Zeder 2009). Second, the complex interactions between ideological, technological, social, demographic, economic and environmental change, with the relative importance of these as drivers and as consequences varying with place and time.

Although progress on understanding the roles of climate change, population growth and other such factors is to be expected, along with improvements in the quantity and quality of archaeological evidence, we must also address how people came to ‘think Neolithic’. That requires attention to a neglected driver of cultural change: the formation of new words and modifications to the meanings of existing words.

The focus on words might sound problematic: by definition, prehistorians cannot access the lexicons used by our Stone Age ancestors. Nevertheless, if – as I will argue – the formation of new words is fundamental to cultural change, prehistorians have no choice but to engage with models that relate language, mind and culture. Moreover, prehistorians have a responsibility to support the further development of such models by providing the long-term perspective that can only be secured from the archaeological record. That is my intention. I will use the Neolithic transition in SW Asia, and especially in the southern Levant, as a case study, while seeking to contribute towards a generic model of cultural change applicable to all periods of the human past, present and future.

WHAT IS CULTURE?

I have neither the ability nor the intention to answer this question, one to which there has been a multiplicity of answers (Spencer-Oatley 2012). But it cannot be avoided entirely: however culture is defined, mobile hunter-gatherer communities had different cultures to each other, to sedentary Neolithic communities, and to the cultures of those communities who combined hunting, gathering, cultivation, herding and farming into a single lifestyle. For my purposes I favor the holistic view of culture espoused by Edward Tylor (1871, 1) that underwrites many of the later proposals: “Culture is that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society”. I certainly do not adhere to Tylor’s social evolutionist views and I am prepared to forgive his use of the term ‘man’ rather than persons of any, or no specific, gender. Moreover, my preference would be that ‘language’ is added to Tylor’s list, rather than simply being implied: however culture is defined, language must be at its core either as an expression of culture or more likely one of its key ingredients.

Culture in this holistic sense is ultimately based on a cognitive model of the type that Hofstede (1994, 5) promotes: culture “is the collective programming of the mind which distinguishes the members of one group or category of people from another”. The emphasis placed by Tylor and Hofstede (and many others) on sociality is crucial: our culture is primarily socially constructed,

especially during childhood. Because we have our own unique social networks, each of us has our own unique culture, our personal culture, which is also shaped by our own particular experiences, thoughts and feelings. Moreover, our own personal cultures are in constant flux: the culture I have today is subtly different from that I had yesterday and is likely to be significantly different to that I will have 10 years hence. Moreover, I have the capability to actively change my culture, such as by embedding myself in a different social network (perhaps a different country or linguistic community).

My own unique Tyloresque ‘capabilities and habits’ have strong overlaps with those of my close family and friends; we can be said to share a culture. My ‘capabilities and habits’ also overlap with those in my wider social network and with those who have been influenced by similar social environments and experiences, some of whom I may have never met; we too can be said to share a culture. In this regard, I am a member of multiple and overlapping cultures, each with their own set of shared characteristics (e.g. Mithen family, Middle Class, Western, academic and so forth). I am unlikely to be aware of some of the cultures to which I belong, despite these being readily identified by others.

CULTURE IN THE EPI-PALAEOLITHIC AND NEOLITHIC

The term ‘culture’ in the Epi-Palaeolithic and Neolithic archaeology of SW Asia derives from Childe’s materialist approach of the 1920s/30s which defined archaeological cultures in terms of recurring associations of certain types of artefacts, that he assumed was the material expression of ‘a people’ (Childe 1929). This was quite different from the contemporary anthropological usage of the term, which drew on Tylor’s definition. Nevertheless, in his writings Childe also embraced a view of culture as the suite of non-biologically acquired characteristics of a people, equating this with his archaeological definition (McNairn 1980). Childe was later quite explicit that his Marxist interpretation of how societies adjust to their environments “is precisely what anthropologists since Tylor have called culture” (Childe 1979, 93-95).

For SW Asia we recognize a hierarchy of cultural groupings. At the coarsest grain we distinguish between the Epi-Palaeolithic (hunter-gatherers, *c.* 21,000-12,000 BP, some of whom may have been engaged in cultivation) and the Neolithic (that includes both farmers and hunter-gatherers who were also engaged in cultivation and animal herding, *c.* 12,000-6500 BP). The Epi-Palaeolithic can be divided into numerous cultural entities on the basis of variation in material culture, notably the style of stone artefacts, while the Neolithic is divided into three cultural entities that are broadly in chronological succession: (1) the Pre-Pottery Neolithic A *c.* 12,000-10,550 BP: hunter-gatherers associated with particular material culture items, notably El-Khiam points in the Levant, and most likely engaged in cultivation and animal herding; (2) the Pre-Pottery Neolithic B *c.* 10,550-8300 BP: in which domesticated resources are more significant and substantial architecture develops, with so-called mega-sites on the eastern side of the Jordan Valley with populations that may have

exceeded 2000 persons; (3) the Pottery Neolithic *c.* 8300-6500 BP: farming with a full repertoire of domesticated crops and animals, and a mix of settlements patterns (for a review see Belfer-Cohen & Goring-Morris 2011; Goring-Morris & Belfer-Cohen 2011; Mithen et al. 2018, 7-19).

This sequence is illustrated in Wadi Faynan, southern Jordan (Figures 1 and 2). Within a few square kilometres one finds extensive scatters of Epi-Palaeolithic artefacts at Barqa that are likely to have accumulated over several thousand years, the PPNA site of WF16 with three phases of cultural development, involving the transition from semi-subterranean mud-plaster lined structures to free-standing circular architecture, the PPNB site of Ghuwayr 1 with two-storey rectangular buildings, and the PN site of Tell Wadi Feinan where the final levels indicate the start of copper working (Najjar et al. 1990; Simmons & Najjar 2006; Mithen et al. 2018).



Figure 1: Map of Faynan, showing the location of Barqa, WF16, Ghwayr 1, and Tell Wadi Feinan

It is quite possible that the people who lived within these Epi-Palaeolithic and Neolithic communities identified themselves with cultural entities quite different to those we recognize as archaeologists. I doubt that is entirely the case because of the profound differences in material culture and inferred lifestyles for the archaeologically-defined cultures, as illustrated in Faynan. The archaeology of Barqa, WF16, Ghuwayr 1 and Tell Wadi Feinan certainly suggest their occupants not only had different ‘capabilities and habits’ but also different ways of thinking about and perceiving the world. How would that have arisen?



Figure 2: From top to bottom: Epi-Palaeolithic stone artefacts at Barqa; semi-subterranean mud-lined structures at WF16; Free standing rectangular architecture at Ghuwayr 1 (Photos: Steven Mithen)

LANGUAGE, THOUGHT AND CULTURE

We are born into the world with a number of predispositions and intuitive understandings about the world and the types of entities within it; these structure our initial categorizations of objects, properties and events (Hirschfeld & Gelman 1994). The verbal utterances we hear from other individuals and undertake ourselves builds on that common foundation to influence how we acquire and develop our personal and shared cultures: the information we gain from such utterances shapes our ‘capabilities and habits’. We also acquire our own personal language, or idiolect. Linguists draw generalizations from the idiolects of separate members of a community, as expressed via speech acts, to establish the shared ‘language’ (Weinreich et al. 1968).

Other stimuli also influence the culture and language we acquire. Archaeologists are inevitably drawn to the cognitive impact of material objects (Malafouris 2013) and architecture (Wilson 1988), while gestures, body language, sounds and smells will also be significant. But the proposition of this article is that words are special: they influence how we think about the world in a manner quite different from other stimuli.

The notion that language influences thought, perception, and ones ‘worldview’ in the most general sense, reaches back to at least the 18th century Romantic movement, notably in the works of Johann Gottfried Herder (1744-1803) and Wilhelm von Humbolt (1767-1835) (Leavitt 2011). As traced by Pavlenko (2014), Herder and Humbolt influenced the anthropologist, Franz Boas (1858-1942), a US German immigrant, who proposed that “the categories of language compel us to see the world in certain definite conceptual groups which, on account of our lack of knowledge of linguistic processes, are taken as objective categories, and which, therefore, impose themselves upon the form of our thoughts” (Boas [1920] 1966:289).

Such ideas were further developed by his student Edward Sapir (1884-1939) writing in 1929 that “...we see and hear and otherwise experience very largely as we do because the language habits of our community predispose certain choices of interpretation” (Sapir [1929] 1949:162). Benjamin Lee Whorf (1897-1941) further developed these ideas: “users of markedly different grammars are pointed by their grammars towards different types of observations and different evaluations of externally similar acts of observation and hence are not equivalent as observers but must arrive at somewhat different views of the world” (Whorf [1940] 2012:282-283).

Pavlenko (2014) describes how the extensive, nuanced but often convoluted writings of Sapir and Whorf were transformed by later writers into what became known as the Sapir-Whorf Hypothesis of linguistic determinism. This was a radically simplified and vulgarized version of their recognition of linguistic relativism, one that became a ‘bête noire’ of the academic establishment and had its obituary written by Steven Pinker within the *Language Instinct*, simply stating that “it is wrong, all wrong” (1994, 57). This is indeed most likely correct for the proposition that our language determines how we think (Gleitman & Papafragou 2015), but that is quite different to what Sapir

and Whorf had actually proposed: the Sapir-Whorf Hypothesis as received today having little to do with their preoccupations and concerns (Pavlenko 2014, 299).

The view that language influences our manner of thought and how we perceive the world has remained compelling and been developed in a variety of ways (e.g. Dennett 1991; Diaz & Berk 1992; Carruthers 1996; Carruthers & Boucher 1998; Clark 1998; Boroditsky 2001). Gary Lupyan is a recent champion, using the term ‘language-augmented thought’ and focusing on the use of words as labels in both self-directed speech and public language (Lupyan 2012). By a sophisticated and extensive set of experiments, Lupyan and his colleagues have shown that the use of spoken words enhances the learning of new categories, the ability to remember and reason about familiar object categories, and influences basic visual processing (Boutonnet & Lupyan 2015; Edmiston & Lupyan 2015; Lupyan & Bergen 2015; Lupyan & Clark 2015; Lupyan & Thompson-Schill 2012; see also Clark’s 1998 discussion of words as filters). As such, language, and especially the use of words, plays an active role in shaping our thoughts, whether self-directed or at others.

Words are especially potent cues as to the state of the world. The mental category of a dog might, for instance, be cued either by hearing the word ‘dog’, or by non-verbal cues such as a dog’s bark or a picture of a dog. Experiments by Lupyan and his colleagues found that verbal cues are more effective at activating conceptual representations, preferentially activating the most abstract and diagnostic features of the cued category. A dog’s bark, for instance, would tend to activate the representation of a specific dog, whereas the word ‘dog’ activated a prototypical representation – the categorical mental state (Lupyan & Thompson-Schill 2012; Edmiston & Lupyan 2015).

The manner in which words augment thought is directly relevant to the notions of culture as conceived by writers from Tylor in 1871 to Hofstede in 1994: language promotes conceptual alignment by providing members of a community with a largely overlapping inventory of words promoting the learning of common categories (Lupyan & Bergen 2015). With regard to acquiring the more abstract ideas often associated with culture, the association between concepts and words makes it easier to turn those concepts into cognitive building blocks to acquire more complex and abstract ideas (Clark 1998, 174).

Such views about language-augmented-thought are not dissimilar to the view of Benjamin Lee Whorf writing almost 90 years ago. He is worth quoting at length:

“We dissect nature along lines laid down by our native *language*. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the *world* is presented in a kaleidoscope flux of impressions which has to be organized by our minds—and this means largely by the linguistic systems of our *minds*. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way—an agreement that holds throughout our speech community and is codified in

the patterns of our *language*. The agreement is of course, an implicit and unstated one, but its terms are absolutely obligatory; we cannot talk at all except by subscribing to the organization and classification of data that the agreement decrees. We are thus introduced to a new principle of relativity, which holds that all observers are not led by the same physical evidence to the same picture of the *universe*, unless their linguistic backgrounds are similar, or can in some way be calibrated” (Whorf 1940, 229-231)

WORDS, LIFESTYLE AND CULTURE

The words of a language reflect the relevant interests of the language-using community (Wierzbicka 1997). It is not by chance that the Inuit have many words for snow (Boaz 1911; Krupnik & Müller-Wille 2010), the Hanunóo of the Philippines have likewise for rice (Conklin 1957) and the Scots for rain¹. Neither is it by chance that each profession or sub-culture within a single community will have their own particular set of words. As Wierzbicka (1997, 5) succinctly summarized: “culture-specific words are conceptual tools that reflect a society’s past experience of doing and thinking about things in certain ways; and they help to perpetuate those ways. As a society changes, these tools, too, might be gradually modified and discarded”. This was effectively illustrated by Greenfield’s (2013) study of how vocabulary changed between 1800 and 2000 in the United States as the population shifted from being predominately rural (93.9% of the population in 1800) to urban (79.05% in 2000), drawing on words from more than one million books.

Pagel et al. (2007; Calude & Pagel 2011) showed that the most frequently used words are the least likely to be replaced by new non-cognate words, i.e. ones that do not share an ancestry with the words being replaced. They suggest that most words have about a 50% chance of being replaced by a new non-cognate word every 2000-4000 years (Pagel et al. 2013). Such word replacement, however, refers to the use of a new verbal label for the same thing – they provide the example of there being 45 different ways (i.e. non-cognate words) of expressing the idea of ‘dirty’ within a sample of 87 Indo-European languages (Claude & Pagel 2011). But the lexicon also evolves by the addition of new words for new things – for new ideas, events and inventions that simply did not previously exist. It also evolves by addition of new meanings for existing words, and by the loss of words that have become redundant because their referent no longer exists or is no longer relevant. By introducing new words and new meanings, Whorf’s (1940, 230) ‘implicit and unstated agreement’ of the speech community is challenged, with such new words and meanings proposing that nature should be dissected along new lines.

We are familiar with this: in the January 2018 quarterly update to the Oxford English dictionary there were more than 1,100 new words, senses and subentries². These included ‘me time’, ‘hangry’ (a combination of hungry and angry) and ‘mansplaining’, while ‘snowflake’ adopted the new meaning of a person who is too easily offended. Many of the new words have been in use for some time and hence their entry reflects passing a threshold of common usage.

Such new words derive from a variety of word formation processes, which have strong cross-linguistic similarities (Schmid 2015; Aiguo 2003; Xhina 2013). Word formation is a central area of linguistics, closely connected to other areas of linguistics including inflectional morphology, syntax and phraseology (Müller et al. 2015; Schmid 2015). There are two major processes: compounding, which is the combination of two or more words ('roots') to create a new word, and derivation, which is the addition of affixes. To these we can add a range of other processes, including conversion, reduplication, blending, clipping and acronym-formation. Further processes by which new words enter a language include word coinage, loan words, and eponyms, while repurposing can provide a new meaning to an existing word (Table 1).

Just as new words are formed, so others are lost from the language. Technological innovations have significantly reduced the extent to which words such as 'cassette player' and 'floppy disk' are used, and even more so the use of words such as *fromand*, *toppin knife* and *milk-yoke* (the names of 19th agricultural implements). It is not just the names of objects that are lost. The 'Lost Words' project³ identified 30 words recently 'lost' from the English language that referred to types of persons – and which could reasonably make a comeback in the new age of false truths: an *ambodexter* – a person who takes bribes from both sides; a 'nickum' – a cheating or a dishonest person; a *quacksalver* – a person who dishonestly claims knowledge of medicine; a *momist* – a person who habitually finds fault.

Table 1: Word formation processes (from Schmid 2015 and Bodle 2016)

Process	Description	Examples
Composition or compound-ing	The combination of at least two words	'Fiddlesticks'; 'claptrap'; 'carbon dating'; 'bailout'; 'daydream'; 'awe-inspiring'; 'environmentally friendly'
Derivation	Adding either a prefix or a suffix (or both) to a word	'Democratise' (invented in 1798); 'detonator' (1822); 'preteen' (1926); 'hyperlink' (1987)
Backformation	The deletion of an affix or part of a word	'Sleaze' was back-formed from 'sleazy' in about 1967. A similar process brought about 'pea'; 'liaise'; 'enthuse'; 'aggress'; 'donate'
Reduplication	The repetition of a word or word-like element either unchanged, with a different vowel or a different consonant	Hip-hop; Boogie-woogie

Blending	Combining at least two words and either shortening one or both of them	'sitcom'; 'paratroops' 'internet'; 'sexting'
Clipping	The deletion of the initial or final portion of a word, and preserves the original meaning	'Pram' (from perambulator); taxi/cab (both from 'taximeter cabriolet'); 'goodbye' (God be with you), 'berk' (Berkshire hunt); 'curio' (curiosity)
Acronym	Deletes everything except for the initial letters of a two-word or longer phrase, and preserves the original meaning	'laser' (light amplification by stimulated emission of radiation), 'scuba' (self-contained underwater breathing apparatus)
Related processes		
Word coinage	The invention of a new word that does not rely on existing words	Kodak; bling; Google (although this might derive from a misspelling of the number googol (1, followed by 100 zeros)
Conversion	Transposes a word into a new word class	'Giant' originated as a noun meaning a creature of enormous size, but has since become used as an adjective. Thanks to social media, the word 'friend' is now used as a verb (to friend) as well as a noun
Loan words	Borrowing words from other languages.	'Hunk' (from Flemish); 'fetish' (Portuguese); 'tattoo' (Tahitian); 'mammoth' (Russian); shark (Mayan)
Eponyms	Words named after a person or a place	'Alzheimer's'; 'atlas'; 'cheddar'; 'Alsatian'; 'sandwich'; 'wellington'; 'boycott'
Repurposing	Take a word from one context and applying it to another	'Crane' (the lifting machine that got its name from the bird); 'computer mouse'

WORDS AS ANCHORS AND BUILDING BLOCKS FOR THE NEOLITHIC TRANSITION

The process for cultural change starts with new events, new ideas and/or new inventions (Figure 3). Events happen in the external world. These might arise from climate and environmental change, perhaps manifest at a perceptual level by increased frequency of floods or droughts, changes in the timing of animal migrations and the productivity of wild plants. A continuous sequence of events

also comes from social life: births, deaths and rites of passage; the formation of friendships and disputes; quests for influence and power. Events might also consist of the arrival of new people or new material items via exchange ultimately deriving from inventions happening elsewhere.

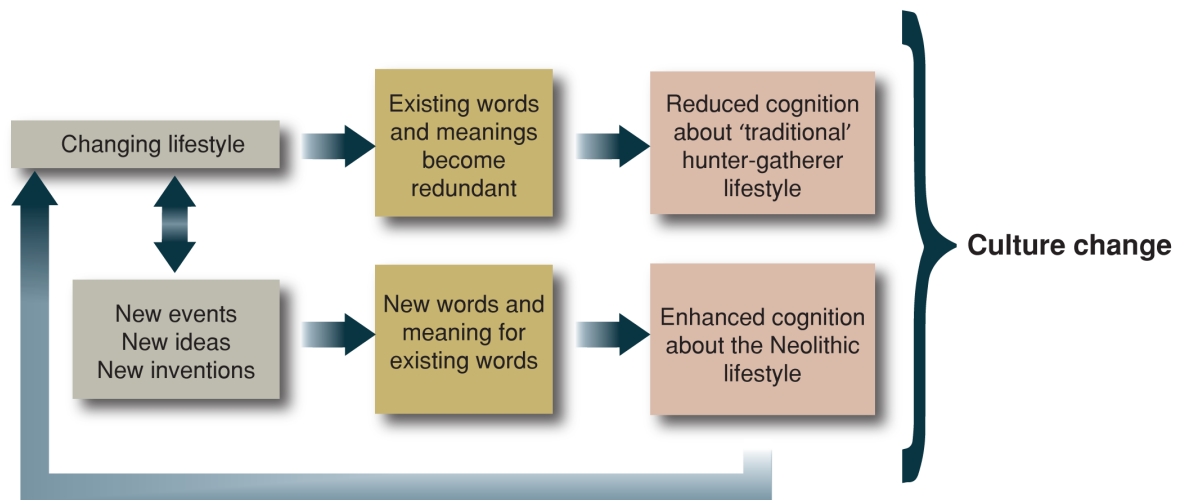


Figure 3: Words and culture change

In addition to new events, new ideas arise. These might derive from a member(s) of the community attempting to solve a problem, from being inherently creative; ideas might also arrive into a community having arisen elsewhere. And there are inventions, such as a new shape of arrowhead or means to project a spear. While these might derive from an idea, many inventions are accidental in nature, arising without any necessary preconception.

New events, new ideas and new inventions arise continuously within the lives of individuals and within human communities – this is the nature of being human (or rather modern human – new ideas and inventions might have been scarcer in pre-modern humans, Mithen 1996). The majority are unlikely to generate widespread culture change: they are novelties rather than innovations, and may disappear just as quickly as they arose, perhaps when a person dies; they are part of the existing culture. Cultural change will only arise when these events, ideas or inventions become widely adopted, leading to a significant change in lifestyle and, using Hofstede's phrase, a re-programming of the collective mind, or in Tylor's phrase, a change in 'capabilities and habits', or with regard to Whorf, 'dissecting nature' in new ways.

New ideas and inventions might spread without any change in the lexicon, causing a gradual change in human lifestyles. Early Neolithic people may, for instance, have begun planting a biologically domesticated strain of barley acquired by exchange (an event) without making any lexical distinction between its seeds and those of wild barley strains also acquired by exchange. Because of the former's greater productivity and dependency on human intervention, it would have led to a gradual change in human lifestyle.

My proposition, however, is that if and when a new word was invented for that new strain of barley, perhaps only after several harvests that allowed its difference to wild barley to become fully apparent, the rate and impact of the change in lifestyle would have been significantly greater because the new word supported a new concept in the mind, one that influenced thought and perception. Following Edward Sapir the new ‘language habit’ of the community – i.e. the use of this new word – would have predisposed its members to new interpretations of the world, while following Whorf, the new word would have amounted to a new ‘agreement’ within the community of how nature should be dissected, organized into concepts and ascribed significance.

Moreover, that new word/concept would have provided a building block for more complex ideas about farming – ideas that were inaccessible to those who cultivated the domesticated barley without making a verbal distinction from the wild barley.

LEXICAL CHANGE DURING THE NEOLITHIC

We have no direct access to the words used by Epi-Palaeolithic hunter-gatherers, early Neolithic cultivators, or later Neolithic farmers in SW Asia. Arguments that they spoke Proto-Indo-European (PIE) (Renfrew 1987; Mallory 1989) have been challenged by genetic evidence for a massive migration into Europe at c. 4500 BP, suggesting that PIE principally arose in Steppe region of modern Ukraine and southern Russia rather than in Anatolia and elsewhere in SW Asia (Haak et al. 2015). As such the reconstruction of PIE from its descendant languages (Mallory & Adams 2006) may have less relevance to the Neolithic of SW Asia that had previously been anticipated. Their language(s) is likely to have fallen into the Eurasiatic language family (Greenberg 2000; 2002), this providing the possibility of proposing certain linguistic features on the basis of commonalities between Eurasiatic languages today (Ruhlen 2008; Pagel et al. 2013). Recent genetic evidence from East Africa has, however, indicated a significant Levant-Neolithic contribution (Skogland et al. 2017) raising the possibility that SW Asia might have been the source for some Afroasiatic languages (Reich 2018).

My concern in this contribution is neither with reconstructing whatever language(s) were spoken in the Epi-Palaeolithic and Neolithic SW Asia nor with attempting to identify specific words and when they may have arisen by exploring commonalities in the likely descendant languages. My interest is with considering how the Epi-Palaeolithic and Neolithic lexicon might have evolved during the transition from hunting and gathering to farming lifestyles, and how that influenced thought and culture. Despite our limited knowledge about that lexicon, we can reasonably expect that through time some words would have changed in their frequency of usage, new words would have been invented, meanings would have changed and some words would have become redundant and lost. The key point is because words augment thought such lexical change would have been a driver of cultural change rather than merely a derivative.

While some reasonable assumptions can be made, we are inevitably involved in a significant degree of speculation as to how and when the lexicon changed during the Neolithic transition. As noted above, this was a long-term process between c. 20-10,000 years ago, during which we should expect words to have been introduced before their referent is necessarily observed in, or can be observed from, the archaeological record.

New words and concepts about settlement and architecture

Sedentary lifestyles appear to have arisen during the Early Natufian and the Pre-Pottery Neolithic A, when cultivation and animal herding may have been undertaken but before domestication (Rosenberg and Redding 2000; Belfer-Cohen and Bar-Yosef 2002; Byrd 2005). Wilson (1998) argued that living in permanent settlements was the most fundamental shift in the Neolithic transition, with the built environment influencing attention and the house providing a ‘tool for thought as well as a technology of shelter’ (Wilson 1998, 5). My contention is that any such cognitive and cultural change arising from sedentism would have been dependent upon the introduction of new words, or new meanings for existing words.



Figure 4: The amphitheater-like structure and earliest free-standing building (in the foreground) at WF16 (Photo: Bill Finlayson & Steven Mithen)

Several architectural developments are illustrated by the Faynan sites and found elsewhere in the Levant. These include: the construction of raised floors, the building of free-standing rather than semi-subterranean structures, a change from circular to rectangular architecture, the development of special-use buildings, and so forth. It seems inconceivable that such developments could have happened without a change in word frequencies, the invention of new words and the loss of others

For a specific example, consider Figure 4 which illustrates the amphitheater-like mud-clay structure at WF16. This has a central ‘trough’, radiating ‘raised gullies’ and surrounding two-tier ‘benches’. It was constructed at c. 11,200 BP and is a unique type of structure in both design and size for the PPNA. A few centuries later, after this structure had gone out of use, a free-standing circular building with massive walls was constructed over the eastern end of this amphitheater-like structure, the earliest known for the PPNA (in the foreground of Figure 4). As evident from the former sentences, we lack suitable words to describe these architectural innovations. What words would have been invented in the PPNA? And how would the words for these two types of structure have been related to those for the mud-lined semi-subterranean structures known from the PPNA (Figure 2, middle) and preceding Epi-Palaeolithic that have strong similarities in construction methods but evidently a quite different function? One can speculate that some process of word formation was involved, perhaps compounding the word for a semi-subterranean dwelling with words for the specific activities that occurred within these new structures.



Figure 5: The PPNB ‘staircase’ at Ghuwayr 1 (Photo: Steven Mithen)

Such word formation would have continued into the PPNB. Figure 5 illustrates the stone built ‘staircase’ at Ghuwayr 1, the only example known from the PPNB in the Levant. The steps might be envisaged as tiered benches, with the staircase playing a similar social, public space at Ghuwayr 1 to the mud-clay benches within the amphitheater-like structure at PPNA WF16. What word would have been invented for this ‘staircase’?

In summary, it is unlikely that the transition in settlement patterns and architecture from temporary hunter-gatherer camps of the Epi-Palaeolithic to the ‘mega-sites’ of the PPNB, could have occurred without the invention of new words, the changing of meanings for existing words, and the loss of words from the lexicon. These changes underlie, I would argue, the cognitive changes that define ‘thinking Neolithic’ – or perhaps more accurately thinking many different types of Neolithic. This prehistoric transition into sedentism and proto-urbanism has a resonance with the shift from rural to urban settlement in the US between 1800 and 2000 that had a profound change in the lexicon (Greenfield 2013), reflecting not just changing entities but also social and cultural values.

New words and concepts about society and ideology

The emergence of sedentism and the architectural developments throughout the Neolithic transition are likely to be associated with changes in social organization, also reflected within mortuary practices. Some form of social differentiation is evident from the Early Natufian in light of the presence of richly decorated burials (Belfer-Cohen 1995), while the variability and complexity of mortuary practices during the PPNA and PPNB suggest a variety of new social roles and concepts (Kuijt 1996, 2000). It is difficult to imagine how these could have become part of a shared culture and sustained without a new social vocabulary from that of the Epi-Palaeolithic. New words would have provided the cognitive building blocks for the emergence of abstract ideas that are likely to arise once sedentism has been established: concepts of property, ownership and territorialism.

We might also note that in the likely context of enhanced social competition within PPNA and PPNB communities when compared to the Epi-Palaeolithic, the skills of oratory, poetry, storytelling and singing may have gained heightened significance as a means of securing status and prestige. In that light, it might be relevant to note that – as I will describe below – it is the poets and playwrights that have been attributed as the most prolific inventors of words (in English).

Cauvin (1994) had prioritized changes in symbolism, religion and the ‘advent of divinities’ as a key driver of the Neolithic transition. His views gained some credence from the dramatic discoveries of imagery in the northern Levant, notably at Göbekli Tepe (Dietrich et al. 2012; Notroff, Dietrich, and Schmidt 2015), while the extensive assemblage of geometrically decorated stone from WF16 suggests that Cauvin ‘rupture of symbolism’ at the start of the Neolithic also occurred in the southern Levant. Again, it is challenging to conceive of how such changes in symbolism and ideology could have arisen unless they were sustained, and in my view ultimately driven, by new words and new meanings for existing words.

It is not unreasonable to assume that words relating to animals and plants would have changed during the Neolithic transition. Epi-Palaeolithic hunter-gatherers exploited a large range of wild plants, and most probably had extensive lexicons referring to not only different species but their different conditions in different environments and seasons – just as the Hanunóo have many words for rice. As reliance on a narrower range of cultivated and then domesticated plants developed, we should expect that some of those words for wild plants diminished in frequency, if not becoming entirely lost from the language, while words for barley and wheat might have increased in number. Conversely, we should expect that new words were invented for the plants that relied on human intervention and provided larger yields. Not just for the plants themselves, but also for the processes of sowing, watering, weeding, grinding, and storing; and also new words for the changes in material culture.

Consider the PPNA cup-hole mortars (Figure 6, top). While these have precedents in the Natufian, they become ubiquitous in the PPNA and take on particular characteristics such as being made on flat stones, positioned within individual house floors, and with a range of forms (Noy 1979). Although we do not know how these were categorized or precisely how they were used, it is not unreasonable to assume that the PPNA language(s) had a distinctive word for these mortars, or perhaps several related words to label different shapes and sizes of cup-hole mortars, those with different numbers of holes, different textures and types of stone, and qualities that we do not recognize today. We might imagine such words were formed from that/those used in the Natufian for stone mortars, perhaps by compounding or derivation. And similarly for the many different types of pestles: while these might have had a single all-encompassing label, it seems likely that there would have been a corpus of words, reflecting the significance of this equipment for the PPNA lifestyle.

There are some items of material culture from the PPNA for which we lack a word but we should assume there had been one within the language(s) spoken during that period. Some of these items have no evident precedent in the Epi-Palaeolithic and, as far as we know, are uniquely found at just one PPNA settlement. At WF16, for instance, there are three separate examples of a combination of a flat stone slab positioned next to the open side of half of a stone bowl, an item that is otherwise unknown in the PPNA (Figure 6, centre and bottom). They were found in quite different contexts and excavated by different members of the archaeology team: one on a floor, one fitted into a wall niche, and one capping a filled in post-pipe (a post-hole moulded in a mud-plaster wall) (Mithen et al. 2018). We can only describe them by referring to their individual elements and how those elements were positioned together; each excavator, never having seen such a combination before, described their particular example with a different phrase. As a recurrent object, we should assume there had once been a word for this item, a word that provided a mental category and delivered cognitive advantage; moreover that word might have been a unique feature of the language spoken



Figure 6: Top: Cup-hole mortar and associated implements at WF16; centre and bottom Stone slab and half bowl combinations at WF16 (Photo: Bill Finlayson & Steven Mithen)

by those at or from WF16, absent from the same language spoken elsewhere in the PPNA. As such, for the PPNA inhabitants of WF16 there would have been a conceptual alignment about this item – something that was quite lacking amongst the archaeologists at WF16 who had no shared word to describe their excavated examples.

We can similarly speculate about words about animals. We should expect there would have been a shifting lexicon about goats across the Neolithic transition with words for different types of wild, herded and fully domesticated goats, relating to differences by sex, age, size, health, colour, behavior, and so forth, just as the Saami have many words for reindeer (Maggia 2006). New words would have been introduced into this lexicon, such as for fully domesticated types of goats, others would have changed in their frequency of use, while others would have been entirely lost. Moreover, a new set of words would have been invented for the new lifestyle of tending to animals: pens, tethers, diseases, levels of meat and fat, culling, herding, and so forth. As this was occurring, other words would have reduced in frequency and perhaps become lost from language, perhaps those relating to tracking wild game.

LINGUISTIC DIVERSITY AND CHANGE IN THE NEOLITHIC OF SW ASIA

The Epi-Palaeolithic period of SW Asia appears to have been a period of diverse and abundant plant and animal resources exploited by mobile hunter-gatherers. Following Nettle's (1999) model for the relationship between ecological risk, social networks and the size of language groups, we should expect relatively high linguistic diversity in the Epi-Palaeolithic. Moreover, such hunter-gatherer linguistic diversity is likely to have increased with population growth (Nettle 1999).

Such languages would have been in a state of change as lifestyles evolved during the process we characterize as the Neolithic transition. This occurred in a mosaic fashion throughout SW Asia. The genetic and faunal evidence for goat domestication, for instance, points to multiple locations (Luikart et al. 2001; Zeder & Hesse 2000; Arbuckle 2014; Horwitz 2003; Finlayson et al. 2014). Similarly a wide variety of plants were cultivated and then some domesticated at slightly different times and places (Hillman et al. 2001; Weiss et al. 2006; Kislev et al. 2006; Morrell & Clegg 2007; Brown et al. 2009; Snir et al. 2015). Changes in material culture and architecture were geographically diverse. While monumental architecture developed during the PPNA it took quite different forms in different areas: richly decorated monoliths and enclosures at Göbekli Tepe in the north (Notroff et al. 2015), a massive stone tower at Jericho in the Mediterranean region (Kenyon & Holland 1982), and mud-constructed amphitheater-like structure in the south at WF16 (Mithen et al. 2011). PPNA burial traditions also varied, even within restricted regions: those at El-Hemmeh involved seated bodies in stone cists while contemporary burials at WF16, 50Km away, were all in crouched positions (Makarewicz et al. 2006; Mithen et al. 2015). The range of architecture, art objects, coarse stone artefacts, stone and shell beads at WF16 is significantly greater than at other

PPNA sites in the southern Levant, suggesting a particular locus of innovation and perhaps the invention of words (Mithen et al. 2018).

This economic and cultural diversity suggests the changes in the frequency of word usage, the adoption of new words, changes to the meaning of existing words, and the gradual loss of others, would have varied throughout SW Asia during the Neolithic transition. New words might have been essential for expressing and conceiving of social and community identity. As such, we might expect linguistic diversity to have increased, reaching its apogee in the PPNA, and then reduced as a similar Neolithic lifestyle reliant on a narrow range of resources became widely adopted in the PPNB and Pottery Neolithic, with an increase in ecological risk and the extent of social networks (Nettle 1999).

WORDSMITHS OF THE NEOLITHIC TRANSITION: WHO INVENTED THE NEW WORDS? AND WHY?

Linguists have difficulty identifying the initial steps of language change, known as actuation, while their primary focus has been on changes in pronunciation rather than the lexicon (Weinreich et al. 1968; Aitchison 2013). Labov's (1972) seminal studies of language change in Martha's Vineyard and New York identified factors including ethnic identity, social class, and age as influencing who would be likely to initiate and then adopt language change. Gender differences have been identified. Trudgill's (1974) study of language change in Norwich, UK, identified that women were more active in consciously changing how they speak, while sub-conscious changes were more likely initiated by working class men. Moreover, they were having a 'tug-of-war' with the pronunciation of certain words, with women pulling towards the overt prestige form and men pulling away from it.

Whether these studies of language change in 20th century English speaking societies are relevant to the Epi-Palaeolithic and Neolithic in SW Asia is unclear. But generalities about word-formation and language change appear relevant to many different languages. Aitchison's (2013, 69) summary is most likely applicable to prehistory: "The spread of language change ... is essentially a social phenomenon, which reflects the social situation. Changes do not occur unless they have some type of prestige. They are markers of group membership, and people outside of the group want, consciously or subconsciously, to belong. However ... it would be a mistake to assume that social factors alone are all we need to know about".

John Milton is credited with having been the most prolific inventor of words for the English language today, with more than 600 including *lovelorn*, *fragrance* and *pandemonium*, followed by Ben Johnson (558), John Donne (342) and Shakespeare (229)⁴. While such poets might have once been the drivers of language change, our current experience suggests the entrepreneurs of digital technology now have this mantle by introducing new words and changing the meanings of others,

such as search-engine, google, tablet, cloud, friend, like, swipe, troll. Moreover, it is the adopters of this technology – often children and adolescents – who determine which words pass the threshold into common usage.

Who were the social climbers, the poets and the entrepreneurs of the Epi-Palaeolithic and Neolithic? Who were the wordsmiths of the Neolithic transition? We cannot answer that question but we can and should acknowledge that these people were central to the process of cultural change that took communities from mobile hunting and gathering to sedentary farming and herding. Without those wordsmiths the new lifestyle novelties of weeding wild stands of barley, herding wild goats, cup-hole mortars and so forth might never have become innovations. Without the power of words to anchor new concepts and then shape our thought and perception, such new ideas and inventions might never have gained a foothold in the mind and traction in society. Without the wordsmiths of the Neolithic transition, we might all still be hunter-gatherers.

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ENDNOTES

1. <http://scottishsceptic.co.uk/2014/11/28/scots-more-words-for-rain-than-eskimos-for-snow>
2. <https://public.oed.com/the-oed-today/recent-updates-to-the-oed>
3. <https://www.directlinegroup.com/media/news/brand/2017/15092017.aspx>
4. <https://www.theguardian.com/uk/2008/jan/28/britishidentity.johnrace>; <https://www.christs.cam.ac.uk/why-milton-matters>

REFERENCES

- Aiguo, W (2003) A comparison of word-formation between Chinese and English. *Asian EFL Journal* 6: 1-24.
- Aitcheson, J (2013) *Language Change*. Cambridge: Cambridge University Press.
- Arbuckle, B (2014) Pace and process in the origins of animal husbandry in Neolithic Southwest Asia. *Bioarchaeology of the Near East* 8, www.anthropology.uw.edu.pl.
- Belfer-Cohen A (1995) Rethinking social stratification in the Natufian culture: The evidence from Burials. In: Campbell, S, Green A, (eds) *The Archaeology of Death in the Near East*, pp. 569-88. Ann Arbor, MI: International Monographs in Prehistory.
- Belfer-Cohen A, Bar-Yosef, O (2000) Early Sedentism in the Near East. In: Kuijt I. (eds) *Life in Neolithic Farming Communities*, 19-28. New York: Plenum Press.
- Belfer-Cohen, A, Goring-Morris, N (2011) Becoming Farmers: The inside story. *Current Anthropology* 52: S209-S220.
- Bodle, A (2016) How new words are born, <https://www.theguardian.com/media/mind-your-language/2016/feb/04/english-neologisms-new-words>
- Boutonnet, B, Lupyan, G (2015) Words jump-start vision: A label advantage in object recognition. *The Journal of Neuroscience* 35: 9329-9335.
- Boas, F (1911) *Handbook of American Indian Languages*. Washington: Government Printing Office.
- Boas, F (1920, reprinted in 1966) The methods of ethology. In F Boas (ed) *Race, Language and Culture*. New York: The Free Press/Macmillan, 281-289.
- Boroditsky, L (2001) Does language shape thought? Mandarin and English speakers' conception of time. *Cognitive Psychology* 43:1-22.
- Brown, TA, Jones, MK, Powell, W, Allaby, RG (2009) The complex origins of domesticated crops in the Fertile Crescent. *Trends in Ecology and Evolution* 24: 103-9.
- Broushaki, F, Thomas, MG, Link, V, Lopez, S, van Dorp, L, Hofmanova, Z, Diekmann, Y, Cassidy, LM, Diez-del-Molino, D, Kousathanas, A, Sell, C, Robson, HK, Martinlano, R, Blocher, J, Scheu, A, Kreutzer, S, Bollongino, R, Bobo, D, Davudi, H, Munoz, O, Currat, M, Abdi, K, Biglari, F, Craig, OE, Bradley, DG, Shennan, S, Veeramah, KR, Mashkour, M, Wegmann, D, Hellenthal, G,

- Burger, J (2016) Early Neolithic genomes from the eastern Fertile Crescent. *Science* 353(6298): 499-503, DOI: 10.1126/science.aaf7943.
- Byrd, BF (2005) Reassessing the emergence of village life in the Near East. *Journal of Archaeological Research* 13, 231-90.
- Calude AS, Pagel, M (2011) How do we use language? Shared patterns in the frequency of word use across 17 world languages. *Philosophical Transactions of the Royal Society of London B Biological Science* 366(1567): 1101-1107 DOI: 10.1098/rstb.2010.03.15
- Carruthers, P (1996) *Language, Thought and Consciousness: An Essay in Philosophical Psychology*. Cambridge: Cambridge University Press.
- Carruthers, P, Boucher, J (1998) *Language and Thought: Interdisciplinary Themes*. Cambridge: Cambridge University Press.
- Childe, VG (1929) *The Danube in Prehistory*. Oxford: Clarendon Press.
- Childe, VG (1979) Prehistory and Marxism. *Antiquity* LIII: 93-95.
- Clark, A (1998) Magic words: how language augments human computation. In P Carruthers, J Boucher (eds.) *Language and Thought: Interdisciplinary Themes*. Cambridge: Cambridge University Press, 162-183.
- Conklin, H (1957) *Hanunóo Agriculture*, FAO Forestry Development Paper No. 12. Rome FAO: United Nations.
- Dennett, D (1991) *Consciousness Explained*. New York: Little Brown and Co.
- Diaz, R, Berk, L eds. (1992) *Private Speech: From Social Interaction to Self-Regulation*. Hillsdale. N.J.: Lawrence Erlbaum.
- Dietrich, O, Heun, H, Notroff, J, Schmidt, S, Zarnkow, M (2012) The role of cult and feasting in the emergence of Neolithic communities. New evidence from Göbekli Tepe, south-eastern Turkey. *Antiquity* 86: 674–695.
- Edmiston, P, Lupyan, G (2015) What makes words special? Words as unmotivated cues. *Cognition* 143: 93-100.
- Finlayson, B, Makarewicz, C, Smith, S, Mithen, SJ (2014) The transition from PPNA to PPNB in southern Jordan. *Studies in the History and Archaeology of Jordan* XI: 105-19.
- Gleitman, L, Papafragou, A (2015) Relations between language and thought. *Oxford Handbooks Online* (www.oxfordhandbooks.com). Oxford University Press, 1-37, DOI: 10.1093/

oxfordhb/9780195376746.013.0032.

Goring-Morris, N, Belfer-Cohen, A (2011) Neolithization Processes in the Levant: The Outer Envelope. *Current Anthropology*, Vol. 52, No. S4, The Origins of Agriculture: New Data, New Ideas (October 2011), S195-S208.

Greenberg, J (2000) *The Eurasiatic Language Family: Indo-European and its Closest Relations*, Volume 1: Grammar. Stanford: Stanford University Press.

Greenberg, J (2002) *Indo-European and Its Closest Relatives: The Eurasiatic Language Family*, Volume II: Lexicon. Stanford: Stanford University Press.

Greenfield, PM (2013) The changing psychology of culture from 1800 through 2000. *Psychological Science* 24: 1722-1731, DOI: 10.1177/0956797613479387.

Haak, W et al. (2015). Massive migrations from the Steppe was a source for Indo-European languages in Europe. *Nature* 522: 167-72, DOI10.1038/nature14317.

Hillman, GC, Hedges, R, Moore, A, Colledge, S, Pettitt, P (2001) New evidence of late glacial cereal cultivation at Abu Hureyra on the Euphrates. *The Holocene* 11: 383-93.

Hirschfield, LA, Gelman, SA eds. (1994) *Domain Specificity in Cognition and Culture*, Cambridge: Cambridge University Press.

Hofstede, G (1994) The business of international business in culture. *International Business Review* 3: 1-14.

Horwitz, LK (2003) Temporal and spatial variation in Neolithic caprine exploitation strategies: a case study of fauna from the site of Yiftah'el (Israel). *Paleorient* 29: 19-58.

Kenyon, K, Holland, T (1981) *Excavations at Jericho: The Architecture and Stratigraphy of the Tell* (British School of Archaeology, Jerusalem, London), Vol 3.

Kislev, M, Hartmann, A, Bar-Yosef, O (2006) Early domesticated fig in the Jordan Valley. *Science* 312: 1372-74.

Krupnik, I, Müller-Wille, L (2010) Franz Boas and Inuktitut Terminology for Ice and Snow: From the Emergence of the Field to the “Great Eskimo Vocabulary Hoax”, In: Krupnik, I, Aporta, C, Gearheard, S, Laidler, GJ, Kielsen Holm, L (eds.) *SIKU: Knowing Our Ice; Documenting Inuit Sea Ice Knowledge and Use*. Berlin: Springer Verlag.

Kuijt, I (1996) Negotiating equality through ritual: A consideration of Late Natufian and Pre-Pottery Neolithic A period mortuary practices. *Journal of Anthropological Archaeology* 15, 313-36.

- Kuijt, I (2000) Keeping the peace: Ritual, skull caching and community integration in the Levantine Neolithic. In: Kuijt I. (eds) *Life in Neolithic Farming Communities*, 137-62. New York: Plenum Press.
- Labov, W (1972) *Sociolinguistic Patterns*. Philadelphia: University of Pennsylvania Press.
- Leavitt J (2011) *Linguistic Relativities: Language Diversity and Modern Thought*. Cambridge: Cambridge University Press.
- Lupyan, G (2012) What do words do? Toward a theory of language augmented thought. *Psychology of Learning and Motivation* 57: 255-297.
- Lupyan, G, Bergen, B (2015) How language programs the mind. *Topics in Cognitive Science* 2015: 1-17, DOI: 10.1111/tops.12155
- Lupyan, G, Clark, A (2015) Words and the world: Predictive coding and the language-perception-cognition interface. *Current Directions in Psychological Science* 24: 279-284, DOI: 10.1177/0963721415570732.
- Lupyan, G, Thompson-Schill, SL (2012) The evocative power of words: activation of concepts by verbal and non-verbal means. *Journal of Experimental Psychology, General*, 141: 170-186, DOI: 10.1037/a0024904.
- Luikart, G, Gielly, L, Excoffer, L, Vigne, JD, Bouvet, J, Taberlet, P (2001) Multiple maternal origins and weak phylogenetic structure in domestic goats. *Proceedings of the National Academy of Sciences* 98: 5927-5932.
- Magga, O (2006) Diversity in Saami terminology for reindeer, snow, and ice. *International Social Science Journal* 187: 25-34, DOI: 10.1111/j.1468-2451.2006.00594.x
- Makarewicz, C, Goodale, N, Rassmann, P, White, C, Miller, H, Haroun, J, Carlson, E, Pantos, A, Kroot, M, Kadowaki, S, Casson, A, Williams, JT, Austin, AE, Fabre, B (2006) El-Hemmeh: a multi-period Pre-Pottery Neolithic site in the Wadi el-Hassa, Jordan. *Eurasian Prehistory* 4: 183–220.
- Malafouris, L. 2013. *How Things Shape the Mind: A Theory of Material Engagement*. Cambridge, Mass: MIT Press.
- McNairn, B (1980) *The Method and Theory of V. Gordon Childe*. Edinburgh: Edinburgh University Press.
- Mallory, JP (1989) *In Search of the Indo-Europeans*. London: Thames & Hudson.
- Mallory, JP, Adams DQ (2006) *The Oxford Introduction to Proto-Indo-European and the Proto-Indo-European World*, Oxford: Oxford University Press.

Mithen, SJ (1996) *The Prehistory of the Mind*. London: Thames & Hudson.

Mithen, SJ, Finlayson, B, Smith, S, Jenkins, E, Najjar, M, Maričević, D (2011) An 11,600 year-old communal structure from the Neolithic of southern Jordan. *Antiquity* 85: 350–364, DOI: 10.1017/S0003598X00067806.

Mithen, SJ, Finlayson, B, Maričević, D, Smith, S, Jenkins, E, Najjar, M (2015) Death and architecture: the Pre-Pottery Neolithic A burials at WF16, Wadi Faynan, Southern Jordan. In C Renfrew, MJ Boyd, I Morley (eds.) *Death rituals, social order and the archaeology of immortality in the ancient world*. Cambridge: Cambridge University Press, 82–110.

Mithen, SJ, Finlayson, B, Maričević, D, Smith, S, Jenkins, E, Najjar, M (2018) WF16: the excavation of an Early Neolithic settlement in Southern Jordan. London: Council for British Research in the Levant.

Morrell, PL, Clegg, MT (2007) Genetic evidence for a second domestication of barley (*Hordeum vulgare*) east of the Fertile Crescent. *Proceedings of the National Academy of Sciences*, 104: 3289–3294.

Müller, PO, Ohnheiser, I, Olsen, S, Rainer, F eds. (2015) *Word Formation: An International Handbook of the Languages of Europe*. Volume 1. Berlin: Walter de Gruyter.

Najjar, M, Abu Dayya, A, Suleiman, E (1990) Tell Wadi Feinan: The first Pottery Neolithic tell in the South of Jordan. *Annual of the Department of Antiquities of Jordan* 34: 27-56.

Nettle, D (1999) *Linguistic Diversity*. Oxford: Oxford University Press.

Notroff, J, Dietrich, O, Schmidt, K (2015) Gathering of the Dead? The Early Neolithic sanctuaries of Göbekli Tepe, Southeastern Turkey. In C Renfrew, MJ Boyd, I Morley (eds) *Death rituals, social order and the archaeology of immortality in the ancient world*. Cambridge: Cambridge University Press, 65–81.

Noy, T. (1979) Stone Cup-Holes and Querns from Gilgal I, a Pre-Pottery Neolithic A site in Israel. *Paléorient* 5: 233-238.

Pagel, M, Atkinson, QD, Calude, AS, Meade, A (2013) Ultraconserved words point to deep language ancestry across Eurasia. *Proceedings of the National Academy of Sciences* 110: 8471-8476, DOI/10.1073/pnas.1218726110.

Pagel, M, Atkinson, Q, Meade, A (2007) Frequency of word-use predicts rates of lexical evolution throughout Indo-European history. *Nature* 449: 717-720, DOI: 10.1038/nature06176.

Pavlenko, A (2014) *The Bilingual Mind, and what it tells us about language and thought*.

Cambridge: Cambridge University Press.

Pinker, S (1994) *The Language Instinct*. New York: William Morrow & Company Inc.

Price, TD, Bar-Yosef, O (2011) The origins of agriculture: new date, new ideas. *Current Anthropology* 52: S163-S174.eich, D. 2018

Reich, D (2018) *Who We Are And How We Got Here*. Oxford: Oxford University Press.

Renfrew, C (1987) *Archaeology and Language*. Cambridge: Cambridge University Press.

Rosenberg, M, Redding, R.W (2000) Hallan Çemi. In: Kuijt I. (eds) *Life in Neolithic Farming Communities*, 39-61. New York: Plenum Press.

Ruhlen, M (2008) New perspectives on the origin of languages. In B Laks (ed) *Origin and Evolution of Languages: Approaches, Models, Paradigms*. Equinox Publishing, 214-256.

Sapir, E (1929, reprinted in 1949) The status of linguistics as a science. *Language* 5: 207-214. Reprinted in D Mandelbaum (ed) *Selected writings of Edward Sapir in Language, Culture and Personality*, Berkeley: University of California Press, 160-166.

Schmid, HJ (2015) The scope of word-formation research. In PO Müller, I Ohnheiser, S Olsen, F Rainer, F (eds) *Word-Formation, An International Handbook of the Languages of Europe*. Berlin: Walter de Gruyter, 1-21.

Simmons, A, Najjar, M (2006) Ghwair 1: A small complex Neolithic community in southern Jordan. *Journal of Field Archaeology* 31: 77-95.

Skogland, P, and 43 co-authors, (2017) Reconstructing prehistoric African population structure. *Cell* 171: 59-71, <http://doi.org/10.1016/j.cell.2017.08.049>

Snir, A, Nadel, D, Groman-Yaroslavski, I, Melamed, Y, Sternberg, M, Bar-Yosef, Weiss, E. 2015. The origin of cultivation and proto-weeds long before Neolithic farming. *PLoS one* 10(7), e0131422. <https://doi.org/10.1371/journal.pone.0131422>

Spencer-Oatey, H (2012) *What is culture? A compilation of quotations*. GlobalPAD Core Concepts. <http://www.warwick.ac.uk/globalpadintercultural>

Trudgill, D (1974) *The Social Differentiation of English in Norwich*. Cambridge: Cambridge University Press.

Tylor, E (1871) *Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Art, and Custom*. London: J Murray.

Vygotsky, L (1934) *Thought and Language*, translated by Kozulin (1962). Reprinted (1986). Cambridge, Mass: MIT Press.

Xhina, O (2013) The enrichment of the vocabulary through words formation processes on both English and Albanian languages. *Academic Journal of Interdisciplinary Studies* 2: 273-282.

Weinreich, U, Herzog, MI and Labov, W (1968) A theory of language change. In WP Lehmann and M Yakov (eds.) *Directions for Historical Linguistics*. Austin: University of Texas Press, 95-195.

Weiss, E, Kislev, ME, Hartmann, A (2006) Autonomous cultivation before domestication. *Science* 312: 1608-1610.

Whorf, BL (1940, reprinted in 2012) Science and linguistics. *MIT Technology Review* 42: 229-3. Reprinted In: Carol J, Levinson S, Lee P (eds) *Language, Thought and Reality*. Selected writing of Benjamin Lee Whorf (ed. J. Carroll). Cambridge, MA: MIT Press, 265-280.

Wierzbicka, A (1997) *Understanding Cultures Through Their Key Words*. Oxford: Oxford University Press.

Wilson, P (1988) *The Domestication of the Human Species*. New Haven and London: Yale University Press.

Zeder, M. (2009) The Neolithic macroevolution: macroevolutionary theory and the study of culture change. *Journal of Archaeological Research* 17: 1-63.

Zeder, M, Hesse, B (2000) The initial domestication of goats (*Capra hircus*) in the Zagros mountains 10,000 years ago. *Science* 287: 2254-7.